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# THE SEWER-GAS QUESTION.

An Analysis
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Illustrated Comparison of the Several Methods and Means of Establishing and Maintaining the Seals of Sewer-Gas Traps.

By E. S. McCLELLAN, M. D.

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# THE SEWER-GAS QUESTION.

## An Analysis and Illustrated Comparison of the Several Methods and Means of Establishing and Maintaining the Seals of Sewer-Gas Traps.

BY E. S. McCLELLAN, M. D.

NOTWITHSTANDING the commendable progress of recent years in house sanitation, the most approved methods of house drainage still have defects, dangers and complications that call urgently for correction and simplification. The putting up of gas-tight drainage pipe is simply a matter of mechanical skill, as easily accomplished as that of making tight gas, water or steam pipe. Engineering skill, however, is necessary to determine the proper sizes of pipes, and their alignment and connections, in order both to secure the immediate discharge from the premises of all liquid waste and sewage to the sewer, and, by the extension of all the main lines above the highest part of the building, of all gases and vapors to the upper air. The proper construction of the fixtures is highly important, and especial care should be taken to avoid all devices with enlarged and concealed cavities above the trap seal; but still more important is the trapping, and the method and means of preserving a seal, or closure, against the escape of sewer air,* at each of the extremities to which the fixtures are attached. Therefore, since the trap seal forms the only barrier against the free outflow of sewer air, the vital importance of its preservation will at once be appreciated. Trapping, and the means of preserving the trap seal, have been and still are the subject of much discussion and diversity of opinion, and in practice are frequently attended with most unsatisfactory results. The defective construction of fixtures and traps, and the inadequacy of the means depended on for the preservation of the trap seals, are, doubtless, accountable for at least 90 per cent. of the evils of bad plumbing. Here, then, is the *danger point* in the present methods of plumbing practice.

* The term "sewer air" is here used to represent the various combinations of vapors, poisonous gases and disease germs found in sewers and drains, commonly, but improperly, called "sewer *gas*."

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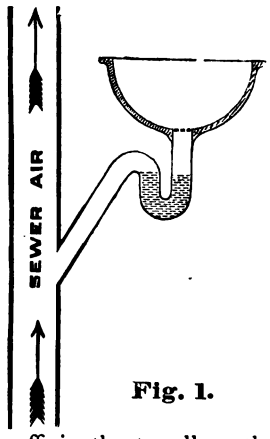


Fig. 1.

The accepted method of forming this seal is by the retention of a small portion of the outflowing water in a loop in the waste pipe near the fixture. This is accomplished by bending the pipe to a shape resembling the letter S, so that the loop, or lower bend, will retain sufficient water to close the pipe and seal it to a suitable depth. **Figure 1** illustrates this, and the bent pipe, thus applied, is called a "sewer-gas trap."

Whenever any variation occurs in the air pressure between the sewer side and the house side of the trap, the water forming the seal will be forced from the side of greater pressure, sufficiently to allow the passage of the required air to re-establish the equality of pressure previously existing between the air in the room and the air in the pipe. Compression of the air in the pipe would result either from a stoppage below the trap, if the pipe were flushed from a higher fixture, or from very bad construction. **Figure 2** illustrates the forcing of the compressed air through a trap caused by a stoppage in the pipe. A discharge through the trap **A**, with the pipe choked up at **C**, forces the confined air of the pipe through the trap **B** into the room. Of course it will be apparent that casualties of this kind cannot be provided against with the system now in use, and must be corrected by the removal of the cause. **Figure 3** (p. 3) illustrates an air-bound condition of pipes resulting from bad construction, and the consequent forcing of the confined air through one trap when the contents of the fixture of one of the other traps is discharged. "**A**" represents the trap of a water-closet; "**B**" the trap of a bath tub, with its waste pipe discharging into the seal of the watercloset trap; and "**C**" the trap of a basin with its waste pipe discharging into the bath waste. It will be observed that the air in the pipes between the three traps is locked, or confined, and can escape only by being forced through some one of the traps. A discharge of water through the trap **C** will necessarily occupy a portion of the air space in the pipe, and the air thus displaced will be forced through the trap **B**, which offers the least resistance; and, vice versa, a discharge through the trap **B** will force the air through trap **C**. The trouble

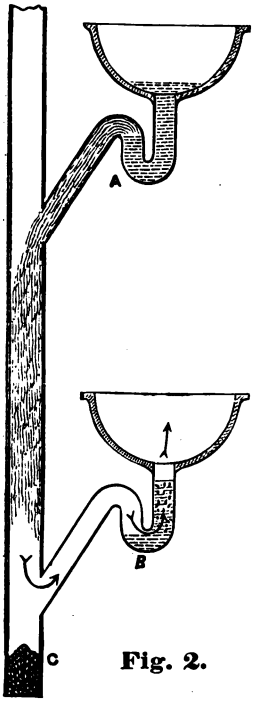


Fig. 2.

here arises from double trapping. If the bath and basin waste had been carried directly into the soil pipe, as indicated by the dotted lines, so as to give free vent for the air to escape into a properly vented soil pipe, this difficulty would have been prevented. But this is not the only defect. The water-closet here shown is also double-trapped and has a large cavity or chamber below the bowl, through which the discharges pass before reaching the main trap (**A**). This chamber soon becomes heavily coated with sewage and is always intensely foul. Whenever the contents of the bowl is discharged, the opening into the chamber is unsealed by the dropping of the pan and the disgusting gases generated by the decomposing filth are driven out into the room. Were it necessary, instances of bad construction might be multiplied indefinitely.

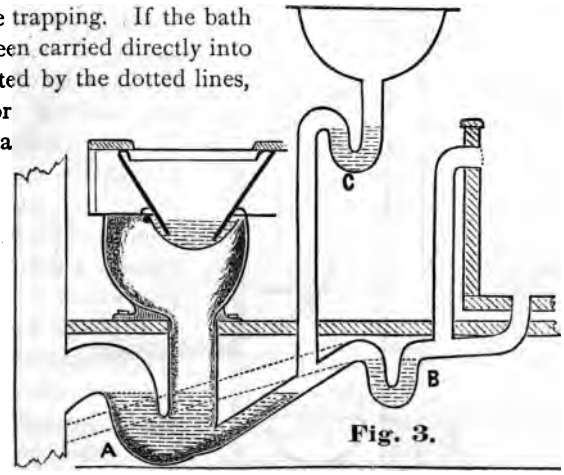

Fig. 3.

[Notwithstanding all our boasted improvements, even in the city of New York, whose sanitary regulations stand deservedly high, there are still to be found, in all classes of dwellings and apartment houses built prior to 1882, thousands of instances where the plumbing is of the character here described.]

On the other hand, if a portion of the air is exhausted from the pipe on the sewer side of the trap, the greater pressure on the house side of the seal will instantly force the air through the trap to supply the required air in the pipe, and will thus carry with it the water forming the seal of the trap and leave an open passage for the entrance of sewer air into the apartment. This is siphonage, and when this action occurs the trap is said to be "siphoned," or unsealed. Thus, when a discharge of sewage passes down a soil or waste pipe the mass drives before it the contained air in the pipe and leaves a partial vacuum. As a consequence, sufficient air must be supplied to take its place and restore the equilibrium previously existing between the air in the pipe and the air in the room; and, unless other passages for its ingress are provided, the required air will be drawn in through the traps on the branches connected with such a line of pipe. This action will siphon, or unseal, any properly constructed trap, and leave an open passage for the escape of sewer air. **Figure 4** (p. 4) will serve to illustrate this action. Notwithstanding the fact that the soil pipe is extended, full calibre, above the roof of the house, a discharge from the

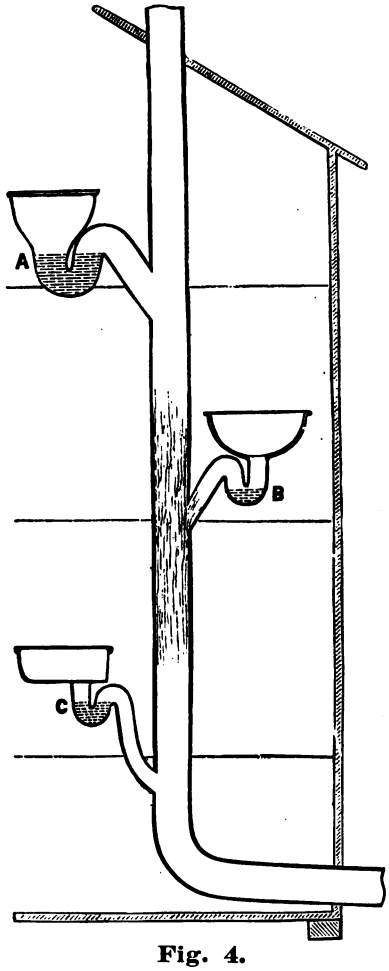


Fig. 4.

closet **A** on the third floor, in its passage down the soil pipe, has siphoned the water out of the trap **B**, and will do the same at **C** as soon as the discharge of water reaches the connection of trap **C** with the main pipe. This result is caused by the continually increasing velocity of the discharged mass of water creating a further demand for air as it passes each of the branch connections.

Although there are many commendable exceptions, these examples represent the average of plumbing work where no prescribed methods have been established by law, and are a sad commentary upon the general lack of knowledge of such physical laws as should enable those in whom we confide to adopt safe methods and means of construction.

There are many traps on the market that retain portions of their seals after siphonage has taken place; but this result is secured at the cost of cleanliness. Indeed, the number and the variety of such traps is almost without limit, but none of them has attained general favor, because of obvious defects. Every such trap must have its body, on the sewer side of its dip, or downward bend, greatly enlarged, so that sufficient air may bubble through the seal to meet the demand for air in the pipe and still leave enough water to maintain a seal. This enlargement, with its attendant angles and irregularities, forms convenient lodgment for the precipitating sediment of the waste. It is only a question of time, therefore, when all such surplus space will be filled with deposits of filth until the water-way will have been reduced to as nearly a uniform calibre resembling the letter S, as the construction of the trap will allow; its anti-siphonic powers will have disappeared, and a miniature cesspool will have been established under each fixture. **Figures 5, 6** and **7** (p. 5) illustrate the filthy condition presented by such traps after they have been in use.

Some of these traps combine, by the use of rubber balls, diaphragms, clappers, etc., an additional feature that further militates against cleanliness

Fig. 5.

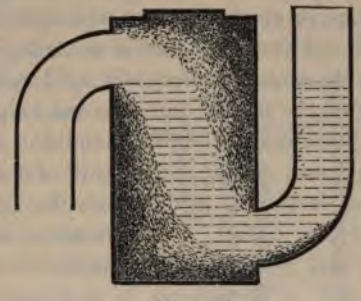

Fig. 6.

Fig. 7.

and durability. Rubber in this situation soon becomes intensely foul, loses its elasticity, and thus becomes worse than useless. **Figure 5** shows one of these balls (**A**) collapsed and forced up into the mouth of the waste pipe. This is of frequent occurrence, especially where hot and greasy water is discharged.

Another source of danger in many of these traps is the single inside wall between the sewer side and house side of the trap seal. Take, for instance, a bottle trap. Such traps are usually made of cast lead, and are liable to have blow holes in their walls. Suppose there is a blow hole in the pipe inside the trap, at or above the water line, as shown in **Figure 7.** This defect cannot be seen, nor readily detected, and yet it establishes an open passage for sewer air into the apartment. Instances are also reported, on reliable authority, where this inside tube was found eaten entirely off by corrosion. The function of the trap was thus entirely destroyed. Still another very dangerous feature was brought to light in Brooklyn by the inspection and removal of a considerable number of traps with inside soft-soldered brass tubes which were found split open as shown in **Figure 8**. The traps of course were thus rendered worse than useless. But in neither of these cases would any leak of water result, and hence no warning of danger would be given until sickness, and possibly death, might result from the unsanatary condition thus established. This evil has been found so serious in the city of Brooklyn, where such traps have been largely used, that the Health Department has considered it necessary to prohibit their further use.

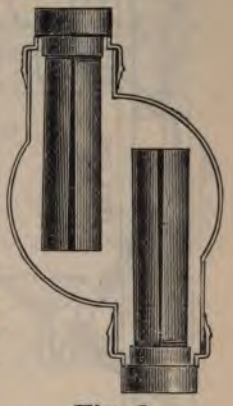

Fig. 8.

Again, the accumulation of filth in such traps is very liable to entangle shreds of lint and form spongy masses extending over the upper bend of the trap into the waste pipe. By this means capillary action is set up, and the water forming the seal is rapidly absorbed and dis-

charged into the waste pipe; while traps, free from these defects, properly flushed, rarely develop this condition. It must be borne in mind, however, that any trap, or even a straight pipe carrying sewage, will gradually fill up and become intensely foul if not adequately and frequently flushed, so as to get the scouring effect of a solid mass of water. Hence, not only the outlet of the fixture, but also the trap and its branch pipe should all be of the same size. When this condition is maintained, fouling or stoppage will not occur, except as the result of flagrant misuse.

In view of these facts it is evident that the simple S trap, with its uniform calibre and easy curves, is less liable to accumulate filth than that of any other possible form; but the difficulties of preserving its seal are the ever recurring source of danger and anxiety. In the year 1881, with the view to maintain greater security to the trap seal, the method of supplying air to the waste pipe by a line of pipe from the top of the house to the trap on the sewer side of its seal was brought into use and made obligatory by the New York Board of Health. Several other cities have since adopted similar rules. This method, illustrated by **Figure 9,** seemed, at first, to offer a satisfactory solution of this much-discussed question; but experience has demonstrated that, while the *theory* of admitting air to the waste pipe on the sewer side of the trap is correct, the *means* adopted, by which this result is sought to be secured, have proved defective and unsatisfactory; and have, in practice, brought many unforseen casualties and dangers. These casualties and dangers are in most cases chargeable to radical defects in the method and are not necessarily the result of bad workmanship. This method is variously known in the plumbing trade as back-venting, back-airing, or re-venting.

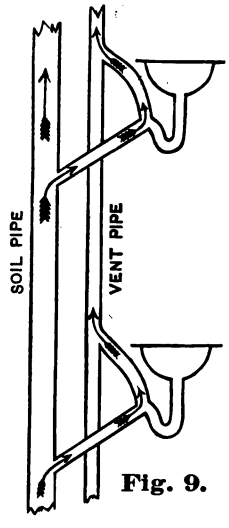

**Fig. 9.**

We know that a short and direct vent pipe, of suitable size, will prevent siphonage; but every one who has had experience in building knows also that short and direct vent pipes are the exception and not the rule. It has been demonstrated by tests made under the direction of the National Board of Health, and by many private investigators, that such a pipe, of even moderate length, if it has several angles (common in practice) will not prevent siphonage. This is likewise true if the length is great, even when the pipes are direct. The upward current in these pipes frequently reaches a velocity of from 5 to 8 feet per second. It would, therefore, be folly to expect any adequate security against siphonage on the lower floors of high buildings if the movement of this ascending column of air must first be arrested and reversed to furnish the necessary air supply. Instances of failure, under such circumstances, are of frequent occurrence.

Figure 9 (p. 6) shows this method under the most favorable circumstances, while **Figure 10** presents one of the many conditions in which failure is almost certainly assured. In this instance the vent of the trap of a butler's-pantry sink is carried down under the floor and across the building to the main vent. The condition here illustrated is of frequent occurrence, and has been tolerated even in New York until very recently. Here a stoppage in the waste pipe below the trap would result in forcing the waste through the vent pipe—ventilation would be totally defeated, and the trap, though increased in depth, would be liable to siphonage continually. But, even without stoppage, it is extremely doubtful if the desired ventilation would be maintained in pipes so arranged. Indeed, it often happens that these pipes become mere containers of foul and stagnant air. Examples might be multiplied to almost any extent in which long lines of pipe, with numerous angles, are required to reach the top of the house. This is especially true in reconstructing the plumbing of houses not originally provided with pipe ventilation, and it applies to nearly every house in New York City built prior to 1882.

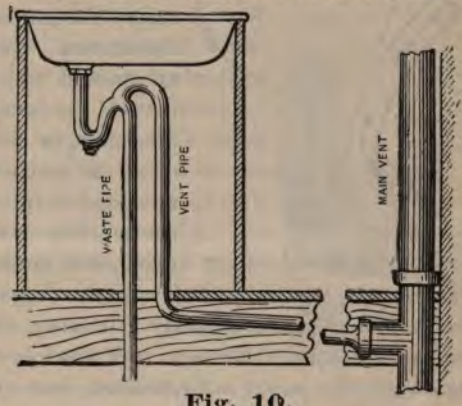


**Fig. 10.**

It is more than probable, too, that back-vented traps are sometimes siphoned during wind and rain storms, from the combined effects of the counter influences developed by the discharge of large volumes of water through the waste system, while, at the same time, a strong counter force is being exerted by a high wind passing over the open ends of the soil and vent pipes. It is evident that the resistance a strong wind would present to the inflowing current of air when the pipes were being taxed to their utmost to supply the demand created by the discharging mass of water, might be quite sufficient to unseal the traps, when neither the discharging water nor the exhausting force of the wind, acting separately, would endanger the trap seals.

This system of back-venting by pipes brings with it another very serious danger to the security of the trap seal. The continuous current of air thus maintained, passing in close proximity to the water forming the seal of the trap, induces its rapid evaporation. The rapidity of evaporation will, however, vary greatly in different situations, depending on the temperature and humidity of the air and the velocity of the air currents developed. The different conditions under which investigators

have made their observations readily explain the diversity of results announced, and demonstrate the fact that not even an approximate average can be determined upon the limited data so far announced.

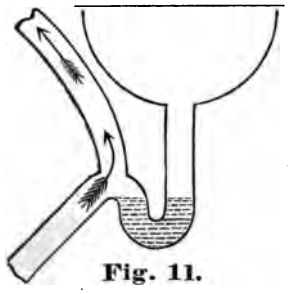

Fig. 11.

The relation of the air current to the water seal of the trap is indicated in **Figure 11** by the arrows. Indeed, it is now conceded that an unused trap, thus vented, is liable to lose its seal by evaporation in two weeks, and, doubtless, in some situations this result would occur in much less time; while the seal of an unvented trap, i. e., not subject to such increased evaporation, but otherwise similarly situated, will endure for months before being destroyed. In a paper full of valuable suggestions, on "House Drainage," in Popular Science Monthly (January, 1889), the well-known sanitary expert, Dr. John S. Billings, says this loss of seal "will occur in about two months if the trap is *not* ventilated, and in about two weeks if it *is* ventilated." This danger, then, according to Dr. Billings, is increased four fold by the presence of these pipes. He illustrates the consequences of such unsealing, as likely to occur in a house temporarily closed: "In a few weeks, sometimes in two weeks, the water in the traps so far evaporates that they are unsealed, and then follows a stream of air into the house, bearing with it micro-organisms, which gradually settle in the layer of fine dust which gathers on the floors, shelves, ledges over doors, gas fixtures, etc. If now the family returns and occupies this house, using only the ordinary processes of sweeping, dusting, etc., which do not destroy the germs, but merely scatter them about, there is serious danger of sickness." Dr. Billings might well have added, also, in enumerating the recipients of micro-organisms, such articles as carpets, bedding, closets, upholstered furniture, etc., all of which form excellent lodging places for disease germs.

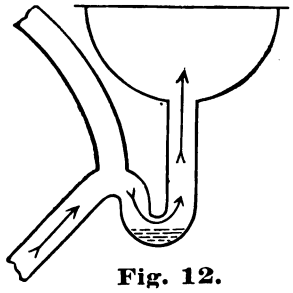

Fig. 12.

It will at once be seen that all the conditions here set forth by Dr. Billings apply with equal force to a bed chamber which may have remained unoccupied for a short time, as to an unoccupied house. When one reflects that nearly every dwelling has its spare chamber, which is irregularly occupied, it is evident, that even when the best sanitary appliances are used and the most scrupulous cleanliness is observed, if these conditions exist, sickness, and even death, may lurk in this unobserved danger. **Figure 12** shows the condition here set forth. The trap is unsealed by evaporation, and the sewer air, as indicated by the arrows, is passing into the apartment.

The life of an iron vent pipe is of short duration. Its inner surface is continually exposed to moist air, impregnated with gases which add intensity to the corroding action. One layer after another of rust forms and falls off until the pipe becomes honeycombed and the angles filled with accumulations of rust. **Figure 13** represents "a section of three-inch cast-iron vent pipe with a twelve-inch offset, eight feet above the water-closet intended to be vented. This offset and the pipe for ten inches above were filled solid with rust." **Figure 14** represents "a section of three-inch wrought-iron vent pipe with a six-inch right-angle offset, one foot above the water-closet. This offset and the pipe for twelve inches above were filled solid with rust scales." These examples were recently found in repair jobs by Mr. John F. Mathews, of Chicago, who says: "There is not a week passes but what we have one or more cases like these in one, one-and-a-half, two and three-inch pipe." Other plumbers doing repair work confirm Mr. Mathews's statement. Such stoppages, even in a four-inch soil pipe, with an offset above the top fixture, were brought to light by Martin Moylan, Esq., also of Chicago, in a paper read before the Chicago Master Plumbers' Association. In "Architecture and Building" (January 4, 1890), A. H. Napier, E. M., lately one of the Plumbing Inspectors of New York City, says: "The writer recently found in a private house in this city [New York] that of six lines extending above the roof, including two-inch, three-inch and four-inch pipe, all but one were completely closed with rust which had accumulated at offsets a short distance below the roof"; and he well says: "This rapid rusting of cast-iron pipe is a serious matter."

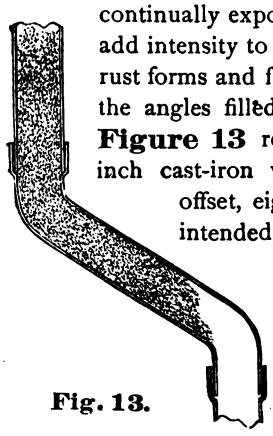

Fig. 13.

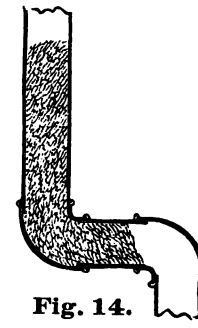

Fig. 14.

The practice of the pipe ventilation of traps has been in vogue in New York City only about eight years, and in other cities not so long; yet such stoppages are becoming exceedingly numerous. Indeed, there can be no doubt but that a thorough general inspection of these pipes would reveal a large percentage of stoppages, and thus demonstrate to the most casual observer their utter unreliability.

Another objection to the use of pipe ventilation is the fact that in very cold weather the discharged moisture is converted into ice and accumulates at the exposed ends of the pipes until the openings are entirely closed. This is a common occurrence in New York City in very cold weather, as a visit to the house tops after a few days of continuous freezing will demonstrate. In more southerly cities it seldom happens, but in colder latitudes very serious and almost continuous trouble is

experienced from this cause during the winter months. When the pipes are thus closed, siphonage will occur in all the traps on the lines involved. Obviously, when the tops of the pipes are closed, and the traps unsealed, the entire volume of the ascending current of sewer air will be discharged through the unsealed traps into the apartments.

It is evident, in view of these facts, that the methods of trap-seal preservation based upon the use of mechanical and so-called "non-siphoning" traps, and of the venting of traps to the roof by long lines of pipe, are complicated, unreliable and positively dangerous.

The alternative now to be considered is in the Automatic Method. In 1871 an attempt in this direction was made by Samuel Lawrence with a device that admitted air to the waste pipe by means of a hinged valve having depending edges which dipped into a groove containing water. The water was relied upon to seal the valve against the outflow of sewer air, but its instability and lack of gravity resistance were altogether inadequate. Other devices have since been made which depended upon the accurate closure of mechanical joints, but all of these have failed to stand the test of practical experience, and are not known to the trade.

Prompted to a further investigation of the subject by the need here indicated, the writer, after a long series of experiments, presented to public favor in May, 1886, an automatic device intended to meet this want. **Figure 15** gives a sectional view of the device. It consists of a body (A A), a thimble (B B), an inverted cup (C C), a mercury seal (E E), and a screw plug (D). The body and thimble are of cast iron, fitted accurately together with a screw joint. The cup **C C** is made of wrought steel. All the parts being finished accurately to a uniform standard go together with the precision of clock work. All these parts are made non-corrosive by the rustless process, and hence, for the use intended, are practically indestructible. (This has been practically demonstrated by actual use during the past four years, with highly-satisfactory results.) The cup **C C** is very light, and its depending edge forms a close-fitting joint at the bottom of the annular groove between the body and thimble. This groove is filled three-eighths of an inch deep with mercury (quicksilver), which forms an absolute seal against the escape of sewer air. The mercury is introduced through the opening at **D** after the device has been permanently placed in position. The moment even a slight vacuum is created on the sewer side of this cup, the greater atmospheric pressure on the house side lifts it out of the mercury and allows a free inflow of air,

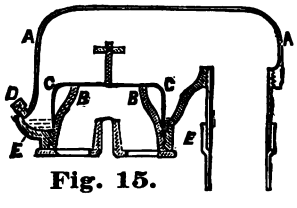

Fig. 15.

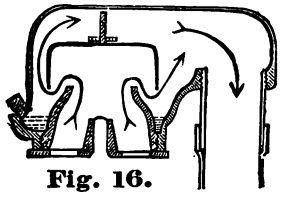
Fig. 16.

until the equilibrium between the air in the pipe and outside of it is re-established. The instant the inflowing current is insufficient to hold the cup in suspension, it drops back by gravity and restores the seal against any outflow of sewer air.

Fig. 17.

**Figure 16** (p. 10) represents the cup thus suspended by atmospheric pressure. The inflowing air is indicated by the arrows.

**Figure 17** gives a perspective view of the device in its normal relation to a trap and fixture.*

Two sizes of this Vent meet all requirements; the smaller having an air space of an inch and a half diameter, the larger, two inches in diameter. The smaller size is adequate for the traps of all the smaller fixtures; while the larger size meets the requirements for four-inch traps. A single Vent of the larger size may frequently be utilized for all the fixtures of a bath room when they are in close proximity. (See **Figure 18.**)

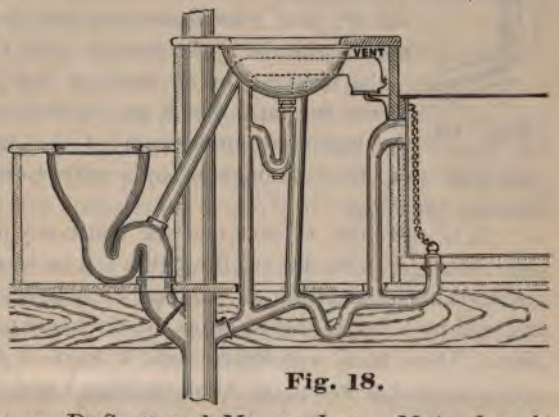


Fig. 18.

This device was tested in June, 1887, at the rooms of the Master Plumbers' Association, 54 Union Square, New York, by a Committee on Sanitary Specialties and Patents (consisting of Edward Murphy, Esq., Col. George D. Scott and Messrs. James Muir, Joseph McDonald and James Gilroy), appointed by the Association at the request of the Health Department, with the view to aid in determining the practical value of such devices as might be referred to them for examination. The apparatus used in making these tests consisted of a vertical one-and-one-half-inch pipe, thirty-one and a half feet long, connected above (by a two-inch valve) to a tank. To this pipe were attached two Y branches, about two feet apart, the upper one of which was eighteen inches below

*This device is known commercially as the "McClellan Anti-Siphon Trap Vent," and sold by all dealers in plumbers' supplies. Illustrated circulars showing details of construction and methods of application may be obtained by addressing the Du Bois Manufacturing Co., 245 Ninth Ave., New York.

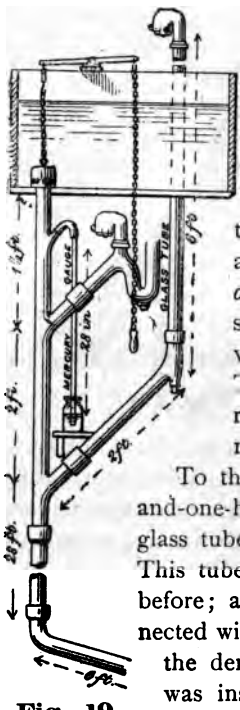

Fig. 19.

the tank. A mercury guage was also attached. (See **Figure 19.**) When these Y branches were closed and the pipe repeatedly flushed, the mercury was drawn up variously, from twenty-four to twenty-eight inches—showing a nearly complete vacuum in the pipe at each discharge. When a one-and-one-half-inch *un*vented trap was attached to the upper Y branch it was *completely siphoned* by a single flush of the pipe; *but with the Automatic Vent attached the trap preserved its seal*, losing only five-sixteenths of an inch of water by the first discharge, while subsequent discharges caused no further loss. The water thus taken out by the first discharge represents the force required to lift the cup out of the mercury.

To the lower Y branch was then attached two feet of one-and-one-half-inch pipe and six feet of one-and-one-half-inch glass tube, with the Automatic Vent at its upper extremity. This tube was filled with smoke and the pipe flushed as before; and, *notwithstanding* that the Vent on the trap connected with the upper branch, only two feet above, supplied the demand for air freely at that higher point, the smoke was instantly drawn out of the tube through the pipe by the increased momentum of the discharge; and both tube and pipe were filled throughout by a corresponding inflow of fresh air through the Vent.

It is, therefore, evident that the constantly increasing momentum of the discharge, in its descent through a soil or waste pipe, correspondingly increases the demand for air, so that each lower branch *thus vented* will respond by a free inflow of air as the discharge passes its point of connection. These local and intermittent inflows of *fresh* air serve to displace any foul air that may have been developed and to *interpose a barrier* of fresh air between the foul air of the soil pipe and the water forming the seal of the trap.

This committee, in a communication to Mr. James C. Bayles, then President of the Board of Health, reported that the tests, though severer as regards siphonage than ever occur in plumbing practice, were entirely satisfactory, and that, in their opinion, the device might be used with advantage, subject to such rules as the Board might prescribe.

This Vent was subsequently specified by Architect E. L. Angell, in a block of five private houses on W. 74th St., New York, and approved by the Board of Health in Sept., 1888. It has since been repeatedly approved by the Board in both public and private buildings; among which may be mentioned the Eighth Regiment Armory,* and can be seen in practical op-

* Specified by John R. Thomas, Architect.

eration in these and other buildings in New York City. It has also been specified in the Masonic Temple* and the North Western Guarantee Loan Company's† building and others less conspicuous, in Minneapolis; the Germania Bank Building‡ and the Germania Life Insurance Building,‖ in St. Paul. Indeed, it is in use to some extent in most of the principal cities of the United States, and no instances of failure or of unsatisfactory results are known to have occurred. Its merits have been acknowledged by many scientific and practical experts, among whom are James C. Bayles, M. E., late President of the New York Board of Health (in a paper read before the State Sanitary Association of New Jersey); Col. Geo. E. Waring, Jr., C. E. (in his recent work, "Sewerage and Land Drainage"); Carroll Phillips Bassett, M. Am. So. C. E., A. H. Napier, E. M. and such well-known practical plumbers as Col. Geo. D Scott, Edward Murphy, Leonard D. Hosford and others. It may be added also that it is fast coming into general use in reconstruction and repair work. In New York City it has been so used in the New York Court House, the Mutual Life Insurance Building, the New York Juvenile Asylum, the Woman's Hospital of the State of New York,§ the Engineers' Club, the Evening Post Building,§ the Alpine, the Windermere, the office building 234-235 Broadway, several Public-School buildings and numerous private houses.

**Figure 20** (p. 14) is an illustration of the present method of back-venting under the New York Plumbing Code. It will be observed that to protect 16 traps from siphonage, three lines of cast-iron vent pipe are required, each extending from the basement to the top of the house, and aggregating about 180 feet. The putting up of this pipe, with the necessary brass ferrules for the trap connections, requires at least 50 lead-caulked joints.

**Figure 21** (p. 15) shows, on the other hand, the same 16 traps protected by 10 Automatic Vents, which furnish absolute security against siphonage. The application of these Vents obviates the use of long lines of vent pipes, the large number of joints, and their great cost. It also avoids the many contingencies under which such pipes are liable to fail.

The saving in cost, in favor of the Automatic Method, may be determined by computing the entire cost of putting up vent pipes including ferrules ready for the trap connections and deducting therefrom the cost of the necessary number of Automatic Vents. The cost of putting up and making the trap connections with the Automatic Vents is about the same as making the connections with the vent pipes.

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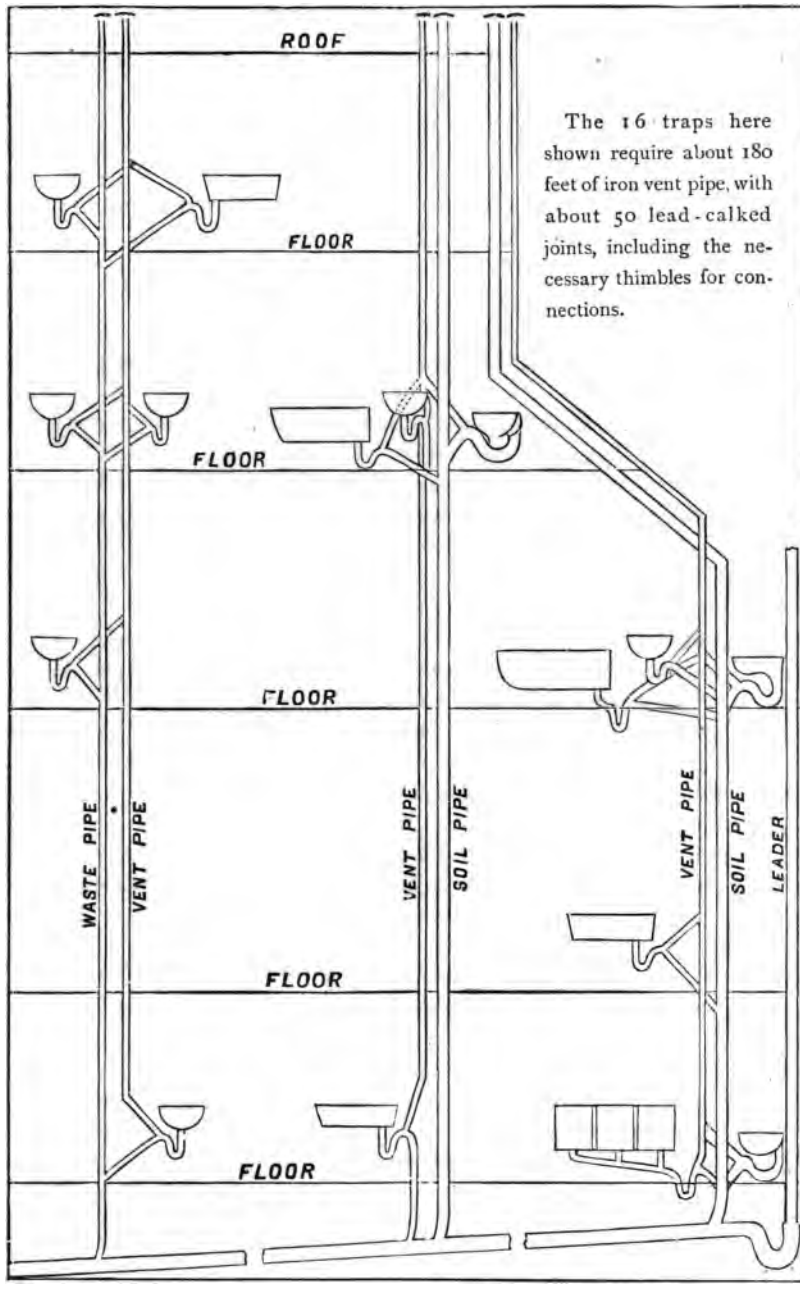
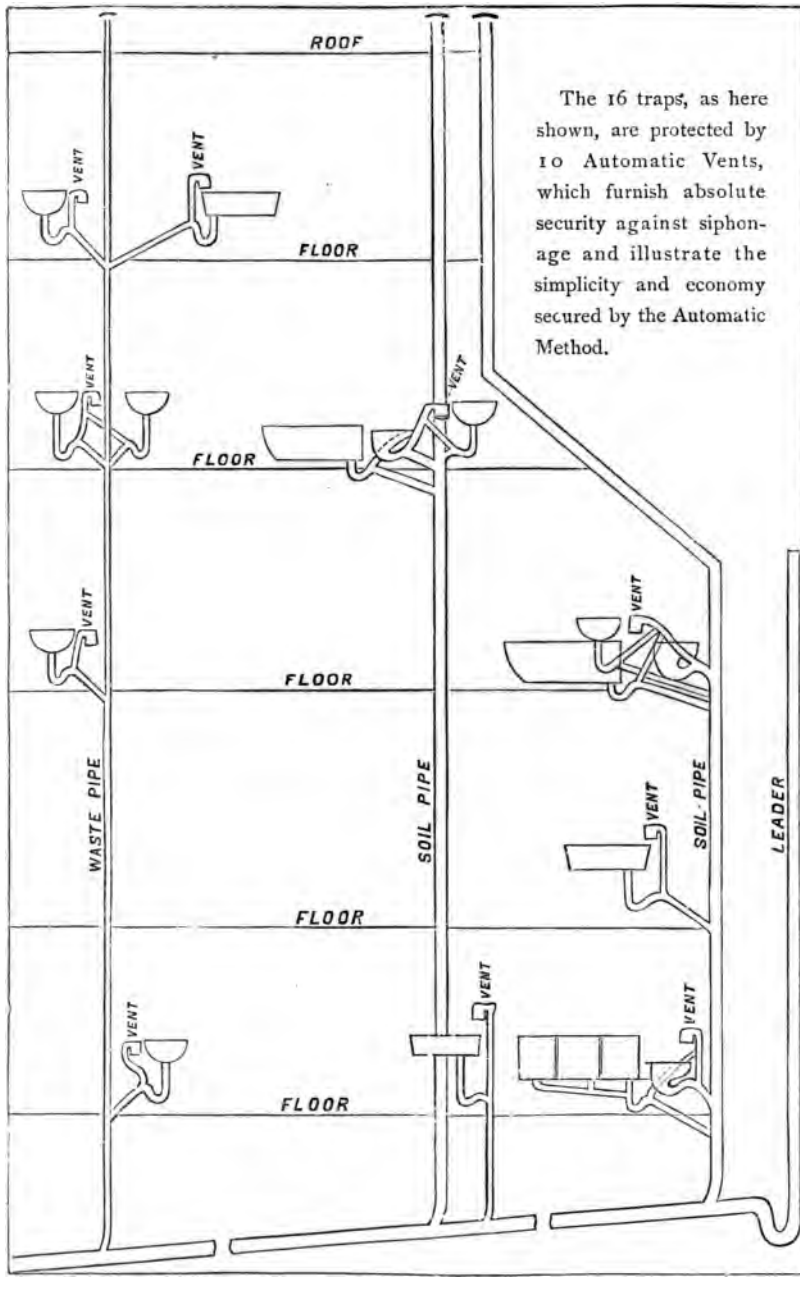
* Specified by Long & Kees, Architects. † Specified by E. Townsend Mix & Co., Architects. ‡ Specified by J. W. Stevens, Architect. ‖ Specified by E. P. Bassford, Architect. § Specified by A H. Napier, E. M.




The above (**Figure 20**) is a section of the plumbing plans of five houses on 74th street, between Ninth and Tenth avenues, New York, which were approved by the Health Department in 1888, and subsequently amended as shown in Figure 21.




The above (**Figure 21**) is a section of the plumbing plans of five houses shown in Figure 20, as amended and approved by the Health Department on September 20, 1888.

## The Advantages Secured by the Automatic Method,

by means of the device here described, are:

*First*—That it affords absolute security against siphonage in all situations and under all conditions liable to occur in plumbing practice, even when the upper end of the soil pipe is closed by frost or any other cause; while the same security is not afforded by any other means.

*Second*—That the fresh air it admits protects the water of the seal from contamination by the soil-pipe air, and, the air current being limited, the evaporation of the water forming the seal of the trap is reduced to a minimum; while, on the other hand, by the continuous current maintained by vent pipes, the water is contaminated and its evaporation increased to the utmost.

*Third*—That it simplifies the drainage system by discarding long lines of vent pipes, reduces the amount of material and the number of joints to a minimum, and correspondingly reduces the danger of leaks and the cost of construction.

*Fourth*—That since the Vent is in plain view, it can be inspected with convenience and certainty; while vent pipes, on the contrary, are usually concealed in the walls and cannot be readily inspected.

*Fifth*—That it is more durable and less liable to get out of repair than vent pipes, because it has fewer joints, is non-corrosive (rustless), and is not subject to the many contingencies which impair or destroy the efficiency of vent pipes.

*Sixth*—That it combines the greatest simplicity, economy and reliability, and is easily applied either in new work or in repairs; while vent pipes are complex, costly and unreliable, and their introduction in reconstruction and repair work is especially annoying and destructive to finished walls.

*Seventh*—That its value is intrinsic; while the most serious defects of pipe ventilation are radical, and as they can be remedied neither by science nor art, are a perpetual menace to the sanitary safety of the premises wherever used.

*Eighth*—That, finally, it fulfills all the necessary purposes sought to be secured by vent pipes and obviates their defects and dangers, and that its general adoption would save annually to the building interests hundreds of thousands of dollars.

## EXPRESSIONS OF OPINION FROM

**James C. Bayles, M. E.,** author of "House Drainage and Water Service," and late President of the N. Y. Board of Health.

"Under the conditions described it works better, I think, than a vent pipe. It responds quickly to a demand for air, but as promptly closes against a current seeking escape through it."

**J. M. Hazen,** Inspector of Buildings.—Minneapolis, Minn., November 5, 1889.

"I have given the Anti-Siphon Trap Vent a careful and thorough investigation, and find it meets all necessary requirements in preventing siphonage. Its reliability, durability and economy commend its favorable consideration. In view of these considerations, its use in this city, whenever properly applied, will be permitted by this department as the equivalent of back-vent pipes."

**J. L. Leal, M. D.,** Health Inspector.—Office of the Board of Health, Paterson, N. J., Nov. 11, 1889.

"This Trap Vent has been well tested in Paterson, and the result is satisfactory. We believe that it is impossible to siphon a trap to which it is properly applied. Our new plumbing ordinance just passed allows its use."

**Col. George E. Waring, Jr., C. E.** (In his recent work, "Sewerage and Land Drainage.")

"The best remedy would be to supply the defective traps at their summits with the McClellan Mercury Seal Trap Vent, a perfectly safe device, of little cost, simple and easy of application, and sure to supply air when needed."

**Carrol Phillips Bassett, M. Am. So. C. E.;** Newark, N. J., June 21, 1889.

"I am much gratified in stating my high appreciation of the value of your Trap Vent, and my confidence in its operation. That you have furnished the public with a satisfactory substitute for expensive vent pipes, which is applicable over a wide range of conditions, must be admitted."

**John Hickman,** Plumber and Gas Fitter; Paterson, N. J., June 5, 1889.

"I have been putting them in now for nearly three years, and have seen them stand the severest tests, and give entire satisfaction when put in according to directions." (Mr. Hickman is now Inspector of Plumbing.)

**Col. George D. Scott,** First President of the National Association of Master Plumbers of the U. S.; New York, June 7, 1889.

"As a practical plumber of long experience, I realize that the venting of traps by long lines of pipes, as now required by the plumbing codes of many of our large cities, is subject to serious well-known objections which are overcome by this automatic vent. Its advantages are its great reliability in preventing siphonage; its simplicity of construction, convenience of application, in both new and old work, and its greater economy."

**M. Houman,** Architect; Paterson, N. J., October 25, 1888.

"It performs all the useful purposes sought to be secured by back-vent pipes, and avoids the evils resulting from their use. . . . I have, during the past two and a-half years specified this Vent in the construction of many houses in this city and vicinity, and always with entire satisfaction.

**H. Mueller & Sons,** Sanitary Plumbers; Decatur, Ill., June 18, 1889.

"We have quite a number of the Anti-Siphon Trap Vents working in some of the finest residences in this city, and they are all giving the very best satisfaction."

**Hughes & Stevenson,** Practical Sanitarians; Montreal, Feb. 10, 1887.

"We have given the Anti-Siphon Trap Vent a month's trial on our office wash-basin with the very best results. Our steam boiler blows off into the drain, and at each operation all manner of traps siphoned, but with the Vent we have no more trouble, and we now can with confidence introduce it to our customers and all who may be similarly placed as we were."

**Leonard D. Hosford,** Secretary of the Master Plumbers' Association of New York City; New York, June 7, 1889.

"After carefully watching the operation of the Anti-Siphon Trap Vent in the many places where I have used it, particularly in my own house, I unhesitatingly indorse it as a protection against trap siphonage, and have always found it to operate satisfactorily when properly adjusted."

**E. M. Buell,** Architect; Syracuse, N. Y., Jan. 17, 1887.

"I have given the Anti-Siphon Trap Vent a good trial, and am very much pleased with its workings, and shall continue its use."

## EXPRESSIONS OF OPINION FROM

**E. Murphy,** Sec'y Master Plumbers' Association; New York, Feb. 8, 1888.

"I have taken unusual interest in testing the capabilities of the McClellan Anti-Siphon Trap Vent, as well in my business as in my capacity as a member of a committee appointed especially to examine into its merits, or the contrary. I am free to say that it fulfilled every claim made for it, notwithstanding the tests were made more severe, as regards siphoning, than are ever found in actual practice. Its advantages, in reducing the cost of plumbing, in furnishing an adequate supply of fresh air, and its non-liability to get out of order, are so patent that further comment would be useless."

**H. J. Fairchild, Esq.;** No. 29 West Twentieth Street, New York, Feb. 16, 1888.

"It is now eighteen months since the Anti-Siphon Trap Vents were fitted in my house; and it gives me great pleasure to state that they have worked most perfectly, and that I have entire confidence in their efficiency and economy."

**A. N. Bell, M. D.;** Office of The Sanitarian, New York, Feb. 14, 1889.

"It affords me pleasure to say of the Anti-Siphon Trap Vent which has been in use in my office for nearly two years: It is entirely satisfactory; has never required any new adjustment, renewal of mercury or other interference."

**Mandable & DeVeney,** Practical Plumbers; Chicago, Ill., November 29, 1889.

"We have been using the Anti-Siphon Trap Vent for some time and have given them several severe tests which have always proved satisfactory, therefore we heartily indorse their use."

**Horace Greeley Knapp,** Architect; 50 Broadway, New York, March 6, 1890.

"Having, in my professional practice during the past year, used the McClellan Anti-Siphon Trap Vent in a large number of houses, both city and suburban, thoroughly establishing to my satisfaction, by practical comparative tests, its many points of excellence, I unhesitatingly recommend it as an unfailing protection against siphonage, and an effectual seal against the passage of sewer gas."

**R. Napier Anderson,** Architect; 74 Fifth Avenue, New York, August 29, 1889.

"I have carefully tested its merits for more than a year past, and consider it a most valuable invention, accomplishing unerringly and automatically the work its name indicates."

**R. C. Baker, M. D.,** Secretary Dep't of Health; Brooklyn, N. Y., March 1, 1890.

"The McClellan Back Vent which I get from you last fall, has proved so successful in preventing the breaking of the water seal of the trap under my office basin, whenever the Zane closet on the second floor was discharged, that I now wish you to send me another one for the basin on the second floor. I prefer your back vent instead of the usual method of carrying a pipe to the open air."

**John Coar,** Builder; 1104 9th Ave., New York. March 11, 1890.

"The Anti-Siphon Trap Vent was specified by my Architect, F. L. Angell, Esq., in the five houses built by me last year on West 74th street. The results of their use are entirely satisfactory. The simplicity, durability and absolute security afforded by this device should secure its general adoption instead of the present complicated and uncertain method of back-venting."

**John F. Mathews,** Plumber and Gas Fitter; Chicago, Dec. 3, 1889.

"The Anti-Siphon Trap Vent is all you claim for it, and I consider it superior to long lines of vent pipes. I have used over six dozen of them in the past eighth months and have had no complaint from them. I shall continue to use them, for I know they are the best thing now in use for the purpose for which they are intended."

**Reinecke & Co.,** Plumbers and Gas Fitters; Pittsburgh, Pa., Feb. 25, 1889.

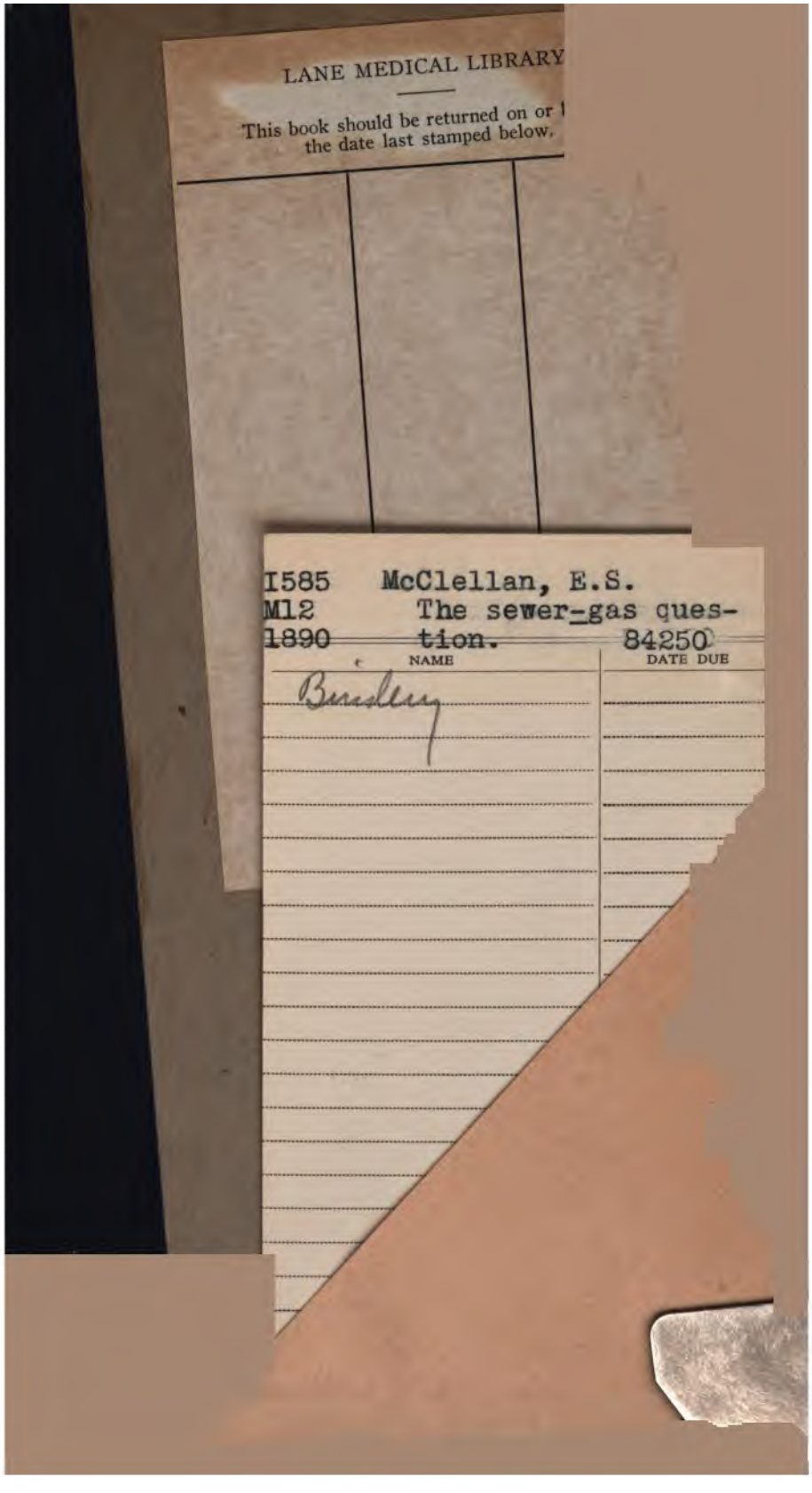
We have used the McClellan Anti-Siphon Trap Vent since we first found we could get such an article, and have not yet seen anything that is its equal, as we find it very effective where it would be too costly or inconvenient to put in long lines of vent pipes."

**James Armstrong,** Plumbing, Steam and Gas Fitting; New York, Feb. 8, 1888.

"Nearly two years ago I put a McClellan Trap Vent in my house in a good position to test its merits. This test has been entirely satisfactory; and, by a recent inspection of this and several more of these Vents put into use some sixteen months ago, I find them free from rust, the mercury seals without apparent loss of mercury, and the practical results most satisfactory."

**Ontwater & Felter,** Carpenters and Builders; New York, November 13, 1889.

"The McClellan Trap Vent used in the plumbing of our houses on West 158th street gives entire satisfaction."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